REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM,

FOR THE KHARIF SEASON, 1883.

ALLAHABAD:

NORTH-WESTERN PROVINCES AND OUDH GOVERNMENT PRESS.

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From

The DIRECTOR, DEPT. of AGRI. and COMMERCE,
North-Western Provinces and Oudh,

To

The SECRETARY to GOVERNMENT,
North-Western Provinces and Oudh,
General and Revenue Department,
Naini Tal.

Dated Cawnpore, the 24th April, 1884.

Sir,

I have the honor to submit Major Pitcher's report on the kharif harvest of the Cawnpore Farm for 1883. It has been delayed owing to the unusual amount of work which was put upon that officer by the Calcutta Exhibition.

2. The rain was both scanty and ill distributed, and the general outturn was in consequence less than that of last year.

3. Being convinced of the futility of applying non-nitrogenous manures by themselves to the soil of the farm, Major Pitcher has made a change in the treatment of three of the experimental plots, adding saltpetre to the plot that was formerly manured with superphosphate only, and sheep-dung to those which used to be manured with bone-dust and gypsum. The comparison will now be with nitrogenous manures only as against the same manures reinforced with gypsum, bone-dust, or superphosphate. Though it is much too early to form a definite opinion, the following table would seem to indicate that as yet there is no reason to believe that the addition of non-nitrogenous manures makes any addition to the weight of the grain, or at any rate any addition comparable with the increased cost. For each year the mean yield in grain of both the duplicate plots is given :—

	1882.	1883.
Nitrogenous.		
Cow-dung alone	2,095	1,316
Saltpetre alone	1,734	949
Nitrogenous in combination.		
Saltpetre and bone-dust	1,626	1,519
Saltpetre and bone superphosphate	...	1,216
Cow-dung and calcic sulphate	1,781	1,312
Cow-dung and bone dust	2,140	1,549
Sheep-dung and bone-dust	...	1,353
Sheep-dung and calcic sulphate	...	1,418

4. The very low yield obtained this year from saltpetre alone is not explained, and as a single instance it is not of much value. The same manure last year gave a larger outturn alone than when combined with bone-dust, a larger outturn than even cow-dung combined with calcic sulphate, and a much larger outturn than has been obtained from any manure whatever in the harvest now reported.

5. The results from deep and shallow ploughing for cotton confirm those for last year, and show, though not perhaps to the extent that might have been expected, that the advantage of a moderately deep ploughing is even greater in a dry year like the last than in a year of ordinary rainfall. Taking 100 as the yield from two shallow ploughings, the proportions of the yield to that obtained by one ploughing at different depths have been as follows :—

	Year.	Shallow.	5 inch.	9 inch.
Farm	1882	100	114·8	107·6
	1883	100	118·1	113·9
Common cultivator	1883	100	112·3	112 8

6. It was found last year that sowing cotton in drills gave an increase of 39 per cent. in cotton and 30 per cent. in seed over the ordinary method of sowing broadcast. This year the further experiment has been tried of sowing on ridges 3 feet apart. The following are the results, the produce being given in pounds :—

Cotton.		Ridges.	Line.	Broadcast.
Nankin ...	Cotton	120	100	56
	Seed	347	301	157
New Orleans ...	Cotton	94	87	86
	Seed	218	209	207
Country ...	Cotton	66	54	81
	Seed	167	145	227

It must be admitted that no safe conclusion can be drawn from these figures, and that the teachings of the plots on which ratooned and new-sown crops have been compared are almost equally indecisive. The largest yield, which was at the rate of 188·5lb. of cleaned cotton to the acre, was obtained from selected acclimatized New Orleans seed sown on ridges.

7. The manufacture of sorghum sugar was attempted for the first time and without success in 1881. In 1882 a small quantity of *gur* was made, and at the last harvest very considerable quantities both of *gur* and *rab* were produced without difficulty. It has now, in fact, been established beyond a doubt that this crop can be grown for sugar with the prospect of a fair profit. It remains to be seen whether it is likely to compete with sugarcane proper in ordinary cultivation. Its advantages are very great, and though the net profit, as calculated in the farm books, does not equal that of sugar cultivation, it is probably as great as that of many other crops which like it do not require the labour, skill, and long use of the soil demanded by sugarcane. As it comes into the market at least a month earlier than sugarcane *gur*, it for that time commands a fancy price like what is paid for winter strawberries, and the first 100lb. sold by the farm realized at the rate of Rs. 6-10-8 per maund in the Cawnpore market. Altogether nearly 20 maunds of *gur* or *rab* were manufactured.

8. In the ensilage experiments the most important result, which agrees with some obtained by Major-General Sir Herbert Macpherson at Allahabad, was the success of pits without any interior coating whatever to protect the fodder from damp or white ants. The question of cost will be taken up in the report on the present *rabi*; but there appears to be no reason why, if plain earthen pits without any masonry lining will serve the purpose, this method of storing fodder should not come into universal use.

9. Some slight improvements have been made in the Kaisar plough, which has, as usual, been very successful at all the local agricultural shows, and further attention has been paid to the pumps, winnowers, and cotton-gins; but the most important introduction in the line of agricultural implements is a sugar evaporator imported from America. This appears to promise a very great saving, both in the original cost and in the expense of manufacturing *rab*, on the existing system of iron pans, and it is not unlikely to have as good a future as the Behea mills. Pandit Ajudhya Prasad of Indulpur speaks of it in the highest terms; and Mr. Nicholls, C.S., who worked one on the Awa estate, reports that it found much favour among his cultivators. It can be made up for less than Rs. 50, and is therefore free from the objection of costliness which is fatal to most improved implements.

I have the honor to be,

SIR,

Your most obedient servant,

W. C. BENETT,

Director.

1884
P.&O.

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOR THE KHARIF SEASON OF 1883.

THE monsoon commenced late, and the first shower of importance was that of July 6th, when 2′4″ fell. From that date up to the 26th July the season seemed propitious. From the 26th July to the 17th August an unlucky break brought injury to the late-sown maize; the showers were still light up to the 20th, and had it not been that the canal distributaries were opened on the 15th August, the loss would have been serious.

The return given below shows the amount of rain and the number of days on which rain fell both at the farm and at the city. Comparison with the normal amount shows how singularly deficient the season proved :—

Month.	*Rainfall in inches.*		*Number of days on which rain fell.*	
	At the farm.	At the city	At the farm.	At the city.
June	35	·60	2	2
July	8·12	9·80	12	11
August	2·82	4·10	6	4
September	2·12	2·70	7	8
October	...	...	...	...
November	...	...	...	...
Total ...	13·41	17 20	27	25
Normal rainfall for the period	26·50		...	

The operations of the season comprised experiments on—

(1) Manures.

(2) Cotton—

(*a*) Deep and shallow ploughing.
(*b*) Broadcast *versus* sowing in drills and on ridges.
(*c*) Cropping the plants a second year.
(*d*) Exotic cottons.

(3) Sorghum and sorghum sugar.

(4) Ensilage.

(1) **Manures.**—This year the duplicated series of plots was completed up to 10 in each series, and the plots which last year were respectively manured with bone-dust, bone superphosphate, and calcic sulphate alone, this year received in addition nitrogenous manures.

The manures applied and crops obtained on these plots for the previous 5 years are shown in the accompanying table :—

Number of plot.		1879-80.		1880-81.		1881-82.		1882-83.		1883-84.	
		Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.
I.	Standard ...	*Nil.*	Cotton	Dung ...	Maize & wheat.	Dung ...	Maize	Dung ...	Maize	Dung ...	Maize,
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ..	Ditto ...	Ditto	Ditto .	Wheat	Ditto ...	Ditto.
II.	Standard ...	Ditto	Ditto	Dung and bone dust.	Ditto ...	Dung and bone dust,	Ditto	Dung and bone-dust.	Maize	Dung and bone-dust.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ..	Wheat	Ditto ..	Ditto.
III.	Standard ..	Ditto	Ditto	Dung and calcic sulphate.	Ditto ...	Dung and calcic sulphate.	Ditto	Dung and calcic sulphate.	Maize	Dung and calcic sulphate	Ditto.
	Duplicate ..	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto	Wheat	Ditto ...	Ditto.
IV.	Standard ...	Ditto	Ditto	Ashes of dung.	Ditto ...	Ashes of dung	Ditto	Ashes of dung.	Maize	Ashes of dung.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
V.	Standard ...	Ditto	Ditto	Poudrette ...	Ditto .	Poudrette ...	Ditto	Potassic nitrate.	Maize	Potassic nitrate.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
VI.	Standard ...	Unknown	Unknown	No manure ...	Fallow ...	No manure ...	Fallow	No manure,	Fallow	Potassic nitrate and bone-dust.	Ditto.
	Duplicate ...	No manure	Cotton	Potassic nitrate and bone-dust	Maize & wheat.	Potassic nitrate and bone-dust.	Maize	Potassic nitrate and bone-dust	Wheat	Ditto ...	Ditto.
VII.	Standard ...	Ditto	Ditto	Bone superphosphate.	Ditto .	Bone superphosphate.	Ditto	Bone superphosphate.	Maize	Potassic nitrate and bone superphosphate	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ..	Ditto.
VIII.	Standard ...	Ditto	Ditto	Bone-dust ...	Ditto ...	Bone-dust ...	Ditto	Bone-dust,	Maize	Sheepdung and bone-dust	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ..	Ditto.
IX.	Standard ...	Ditto	Ditto	Calcic sulphate	Ditto ...	Calcic sulphate	Ditto	Calcic sulphate.	Maize	Sheepdung and calcic sulphate.	Ditto.
	Duplicate ..	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto	Ditto.
X.	Standard ...	Ditto	Ditto	No manure ...	Ditto ..	No manure ...	Ditto	No manure,	Maize	No manure	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ..	Ditto

During the season under report the treatment has been as follows :—

Ploughing—twice.

Weeding—twice.

Irrigation—twice.

Seed per acre—maize 15 lb.

Manure—as in table.

The outturn is shown below, the figures for last year being also given :—

Manure and rate per acre.	Year.	Outturn per acre. Grain. Standard.	Grain. Duplicate.	Stalk and leaf. Standard.	Stalk and leaf. Duplicate.
		lb.	lb.	Mds.	Mds.
Cowdung, 180 mds.	1883 ...	1,462·5	1,170·0	42 9	31 3
	1882 ...	2,169·0	2,020·5	95 4	89·7
Ditto, 180 mds, bone-dust, 360 lb ...	1883 ...	1,720 5	1,377·0	47 3	37 9
	1882 ...	2,434·5	1,845·0	102 9	87 6
Ditto, 180 mds., calcic sulphate, 240 lb. ...	1883 ...	1,644·0	979·0	45·5	32·2
	1882 ...	1,758 0	1,704·0	87 6	82·5
Ashes of 180 mds., cowdung	1883 ...	1,073·25	712·5	38 6	28·4
	1882 ...	1,452 0	922·5	87 3	71 4
Potassic nitrate, 240 lb.	1883 ...	1,068 0	829·5	45 3	28 8
	1882 ...	2,190 0	1,278·0	111 9	93 3
Ditto, 240 lb, bone-dust, 360 lb. ...	1883 ...	1,793·25	1,244·25	47·6	32·3
	1882 ...	...	1,626·0	...	87·6
Ditto, 240 lb., bone superphosphate, 240 lb.	1883 ...	1,385 25	1,047·75	45·4	34 6
Superphosphate, 240 lb only ...	1882 ...	1,422·0	1,378 5	84·3	81 0
Sheepdung, 120 mds bone-dust, 360 lb. ...	1883 ...	1,797 75	909·0	42 5	27 1
Bone-dust, 360 lb. only...	1882 ...	1,417·5	844·5	79·8	56 7
Sheepdung, 120 mds., calcic sulphate, 240 lb. ...	1883 ...	1,485 0	1,341·0	35·3	34 4
Calcic sulphate, 240 lb. only	1882	1,056 0	912·0	58 5	75 0
No manure	1883 ...	990·0	801 75	34·7	32·3
	1882 ...	1,002 0	924 0	74 7	69 0

Attention may be directed to the increase given by bone-dust where combined with a nitrogenous manure.

Some naturally poor and artificially exhausted soil was divided off into a fresh series of plots, in two of which some refuse from the Cawnpore Woollen Mills was tried, with so far negative result, the material not having had time to decompose. The past and present treatment of the other plots is shown below, following which is given the outturn :—

Previous treatment.			*Treatment during* 1883.					
Year.	Manure.	Crop.	Number of plot.	Manure and rate per acre.	Ploughing.	Weeding.	Watering.	Seed and rate per acre.
1879-80 ...	Guano ...	Wheat ...	1	Brick-kiln refuse, 120 mds.	2	2	2	Maize 15 lb
1880-81 ...	Sheepdung ...	Ditto ...	2	Poudrette, 120 mds,				
1881-82 ...	No manure ...	Cotton ...	3	No manure ...				
1882-83 ...	Ditto ...	Wheat.						

Number of plot.	Manure.	*Outturn per acre.* Grain.	Stalk.
		lb.	Mds.
1	Brick-kiln refuse, 120 mds.	748·5	22·3
2	Poudrette, 120 mds.	874·5	31·9
3	No manure	546·0	20·1

(2) Cotton.—(*a*) *Deep and shallow ploughing*—The experiments of last year were repeated this year on the same four plots.

In addition a new field giving a much larger area, and which had been tilled by the ordinary method for the past five years, was leased from a neighbouring cultivator and was divided into three parts. They were treated as under—

(1) Ploughed twice with a country plough.
(2) Ploughed once to five inches.
(3) Ditto to nine inches.

No manure was applied and country cotton seed was sown broadcast.

The outturn from all these plots is shown below, and the outturn of last year for comparison. Though the results of the five inches ploughing and nine inches ploughing vary somewhat, the net result is in favour of ploughing deeper than what the ordinary cultivator practises.

Number of plot.	Detail of ploughing.	Area in square yards.	Outturn per acre. *In* 1883. Cotton.	*In* 1883. Seed.	*In* 1882. Cotton.	*In* 1882. Seed.	Increase per acre over country ploughing. *In* 1883. Cotton.	*In* 1883. Seed.	*In* 1882. Cotton.	*In* 1882. Seed.
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Series A.										
Plot I.	Twice with country plough ...	300	110·9	249·0	95	202	...	...	...	
,, II.	Once with Kaisar plough 5″ deep ...	300	141·1	308 5	112	229	21 6*	49·4*	14·5*	24·0*
,, III.	,, Watts' plough 9″ deep ...	300	136·1	304·5	105	214	16·6*	45·4*	7·5*	9 0*
,, IV.	Twice with country plough ...	300	128·0	269·2	100	208	...	...	...	...
Series B.										
Plot I.	Twice with country plough ...	1,820	93·4	198 7	...	...	...	...	...	...
,, II.	Once with Kaisar plough 5″ deep ...	1,775	104·9	232 4	...	...	11 5	33 7	...	...
,, III.	,, Watts' plough 9″ deep ...	1,790	114·7	238·4	...	...	21·3	39 7	...	...

* Over the average of the two plots ploughed with country plough.

(*b*) *Drill versus broadcast.*—Seven fields were divided off into plots which were sown with cotton—

(1) broadcast,
(2) in drills,
(3) on the top of ridges,
(4) on the slopes of ridges.

Observation in the previous year had shown that cotton plants were far stronger and healthier when growing on the interior slopes of the field boundaries, and this without reference to light or aspect: hence the establishment of the 4th method of sowing.

Nankin, New Orleans, and country cottons were sown, and the following table gives details:—

Number of field.	Manner of sowing.	Manure and rate per acre.	Ploughing.	Weeding.	Watering between July and November.	Seed and rate per acre.
1	On top of ridges 3′ apart ... ... In lines 3′ apart ... ... Broadcast	Poudrette 200 mds.	2	2	2	Nankin cotton 3 lb. Ditto 3 lb. Ditto 12 lb.
2	In lines 3′ apart; the plants ridged when 6″ high. In lines 3′ apart; plants not ridged ...	Ditto ...	2	2	2	Ditto 3 lb. Ditto 3 lb.
3	In lines 3′ apart ... ... Broadcast	Ditto ...	2	2	2	Ditto 3 lb. Ditto 26 lb.
4	In lines 3′ apart ... ... Broadcast	Ditto ...	2	2	2	Ditto 3 lb. Ditto 26 lb.
5	On tops of ridges 3′ apart ... ... On slopes of ridges 3′ apart ... ... In lines 3′ apart ... ... Broadcast	Ditto ...	2	2	2	New Orleans 3 lb. Ditto 3 lb. Ditto 3 lb. Ditto 12 lb.
6	On tops of ridges 3′ apart ... ... On slopes of ridges 3′ apart ... ... In lines 3 feet apart ... ... Broadcast	Ditto ...	2	2	2	Ditto 3 lb. Ditto 3 lb. Ditto 3 lb. Ditto 12 lb.
7	In lines 3′ apart; subsequently ridged up ... In lines	Ditto ...	2	2	2	Ditto 3 lb. Ditto 3 lb.
8	On tops of ridges 3′ apart ... ... On slopes of ridges 3′ apart ... ... In lines 3′ apart ... ... Broadcast	Ditto ...	2	2	2	Ditto 3 lb. Ditto 3 lb. Ditto 3 lb. Ditto 12 lb.
9	On tops of ridges 2′ apart ... ... On slopes of ridges 2′ apart ... ... In lines 2′ apart ... ... Broadcast	No manure	2	2	2	Country cotton 5 lb. Ditto 5 lb. Ditto 5 lb. Ditto 12 lb.

The cost of making ridges 3′ apart = Rs. 2-10* per acre, and of dibbling in seed 3′ apart on the ridges 9† annas per acre.

		Rs.	a.	p.
* One pair of bullocks with ploughman @ 10 annas a day for 2 days ...	=	1	4	0
Three men @ 2 annas a day for 2 days	=	0	12	0
Four women @ 1 anna 3 pies per day for 2 days	=	0	10	0
Total ...	=	2	10	0
† Two men @ 2 annas per day	=	0	4	0
Four women @ 1 anna 3 pies per day	=	0	5	0
Total ...	=	0	9	0

In drills the cost = Re. 1-1-0 per acre for lining and sowing.

In sowing broadcast the cost = 10 annas per acre.

Taking the market value of each class of cotton as under—

	Per maund.
New Orleans	Rs. 20
Nankin	„ 16
Country	„ 12

the following table shows outturn and value of each method :—

No. of field.	Manner of sowing.	Area in square yards.	Actual outturn. Cotton.	Actual outturn. Seed.	Outturn per acre. Cotton.	Outturn per acre. Seed.	Value of produce per acre. Cotton.	Value of produce per acre. Seed.	Value of produce per acre. Total.	Increase in value by sowing in lines over broadcast.	Increase in value of produce by ridging. Over lines.	Increase in value of produce by ridging. Over broadcast.
			lb. oz	lb. oz.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p	Rs. a. p	Rs. a. p.
	A.—Nankin cotton fields.											
1	On top of ridges 3′ apart	791	15 8	45 0	94·8	275·3	18 7 9	4 3 1	22 10 10	...	4 1 11	9 11 3
	In lines 3′ apart ...	882	14 2	41 2	77·5	225·7	15 1 11	3 7 0	18 8 11	5 9 4	...	...
	Broadcast ...	2,023	22 12	65 14	54·2	157·6	10 9 2	2 6 5	12 15 7	...	...	...
2	In lines 3′ apart; subsequently ridged up ...	2,197	65 10	190 7	144·5	419·5	28 3 1	6 6 2	34 9 3	...	4 0 9	...
	In lines 3′ apart ...	2,060	52 3	160 7	126·2	388·2	24 9 11	5 14 7	30 8 6	...	...	...
3	In lines 3′ apart ...	1,737	49 10	147 14	138·2	412·0	26 15 5	6 4 5	33 3 10	17 2 7	...	...
	Broadcast ...	1,302	18 5	49 13	68·0	185·1	13 4 3	2 13 0	16 1 3	...	...	...
4	In lines 3′ apart ...	1,362	16 14	50 5	59·9	178·8	11 10 11	2 11 3	14 6 2	3 8 5	...	...
	Broadcast ...	1,532	14 15	41 15	45·7	128·3	8 14 7	1 15 2	10 13 9	...	...	...
	B.—New Orleans cotton.											
5	On top of ridges 3′ apart	457	12 2	30 14	128·4	326·9	31 5 0	4 15 7	36 4 7	...	Decrease 0 11 10	4 1 7
	On slopes of ridges 3′ apart	546	15 12	38 14	139·6	344·6	34 0 9	5 4 0	39 4 9			
	In lines 3′ apart ..	369	10 6	26 14	136·0	352·5	33 2 8	5 5 10	38 8 6	4 13 5	...	...
	Broadcast ...	574	14 1	37 5	118·5	314·6	28 14 5	4 12 8	33 11 1	...	...	...
6	On tops of ridges 3′ apart.	851	16 14	37 10	95·9	213·9	23 6 2	3 4 1	26 10 3	...	Increase. 2 13 8	6 1 1
	On slopes of ridges 3′ apart	376	6 12	15 0	86·8	193·0	21 2 8	2 15 0	24 1 8			
	In lines 3′ apart ...	861	14 6	32 13	80·8	184·4	19 11 3	2 13 0	22 8 3	3 3 5	...	...
	Broadcast ...	480	6 14	15 10	69·3	157·5	16 14 5	2 6 5	19 4 10	...	...	...
7	In lines 3′ apart; subsequently ridged up.	400	6 10	14 2	80·1	170·9	19 8 7	2 9 6	22 2 1	...	3 11 7	...
	In lines 3′ apart ...	426	5 13	13 6	66·0	151·9	16 1 6	2 5 0	18 6 6	...	...	..
8	On tops of ridges 3′ apart	592	7 13	16 15	63·8	138·4	15 8 11	2 1 9	17 10 8	...	Decrease 0 13 1	Decrease 1 6 5
	On slopes of ridges 3′ apart	543	7 4	15 14	64·6	141·5	15 12 1	2 2 6	17 14 7			
	In lines 3′ apart ...	537	7 7	16 9	67·0	149·2	16 5 5	2 4 3	18 9 8	Decrease 0 9 4	...	...
	Broadcast ...	562	8 1	17 6	69·4	149·6	16 14 9	2 4 3	19 3 0	...	...	...
	C.—Country cotton.											
9	On tops of ridges 2′ apart	750	10 13	27 4	69·7	175·8	10 3 1	2 10 4	12 13 5	...	Increase. 2 0 9	3 2 3
	On slopes of ridges 2′ apart	750	9 10	24 10	62·1	158·9	9 1 4	2 6 7	11 7 11			
	In lines 2′ apart ...	750	8 6	22 9	54·0	145·6	7 14 5	2 3 6	10 1 11	5 3 0	...	...
	Broadcast ...	750	12 9	35 3	81·0	227·0	11 13 7	3 7 4	15 4 11	...	...	...

Allowing in each case for the cost of preparation, it was found that where other conditions were equal the ridge system gave a decided gain over the simple drill, and both again gave better results than broadcast sowing. Where this was not the case the experiments were marred by difficulties in applying irrigation with impartiality—difficulties which would not have occurred had the rainfall been sufficient.

(c) *Cropping the plants for a second year.*—One field of New Orleans and two of Nankin cotton were left standing over from last year and a portion of each was ratooned.

The following table shows the results in juxtaposition with those for 1882. In quality the cotton was inferior to the produce of the same plots last year. The value of woollen refuse in the case of these plots seems very marked, but it is too early yet to say what its value is and

what quantity should be used. It is different to the refuse of English Mills in not having been subjected to the ammoniacal bath which makes the latter so valuable :—

Number of field.	Particulars of sowing and ratooning.	Manure and rate per acre. 1882.	Manure and rate per acre. 1883.	Grubbing.	Weeding.	Watering.	Area in square yards.	Outturn from October to February, 1884. Actual. Cotton.	Actual. Seed.	Per acre. Cotton.	Per acre. Seed.	Outturn of cotton per acre from October 1882 to February 1883.
								lbs. oz.	lbs oz.	lbs.	lbs.	lbs.
1	A.—Sown broadcast in June, 1882, with New Orleans cotton and ratooned in July, 1883.	Dung, 100 lb.	...	1	2	2	1,680	24 7	57 12	70·4	166·3	94·0
	B.—Sown broadcast in June, 1882, and not ratooned.	Ditto,	...	1	2	2	1,728	47 2	118 15	131·9	333·1	
2	A.—Sown broadcast with Nankin cotton in June, 1882, and ratooned in June, 1883.	No manure.	(a) Woollen refuse and lime, 10 mds. to the acre.	1	2	2	272	6 9	13 10	116·7	242·4	113·9
			(b) No manure ...	1	2	2	507	9 10	18 4	91·8	174 2	
	B.—Sown broadcast with Nankin cotton in June, 1882, and not ratooned.	Ditto	(a) Woollen refuse and lime, 10 mds. to the acre	1	2	2	280	7 3	15 1	124·2	260·3	
			(b) No manure ...	1	2	2	462	10 15	21 2	114·5	221·3	
3	A.—Sown broadcast with Nankin cotton in June, 1882, and ratooned in June, 1883.	Ditto,	(a) Woollen refuse and lime, 10 mds. to the acre.	1	2	2	283	6 1	11 10	103·6	198·8	91·3
			(b) No manure ...	1	2	2	585	5 9	10 3	46·0	84·2	
	B.—Sown broadcast with Nankin cotton in June, 1882, and not ratooned.	Ditto,	(a) Woollen refuse and lime, 10 mds. to the acre.	1	2	2	283	6 11	15 6	114·3	262·9	
			(b) No manure ...	1	2	2	644	7 4	14 12	54·4	110·8	

(*d*) *Exotic cottons*—Fresh New Orleans seed was imported from America and was sown in the fields which have already been noticed under the headings of drill and broadcast.

Two other fields were sown with acclimatised New Orleans seed which has been cultivated continuously on the farm for the past six years. One of these fields has already been noticed under drill and broadcast. The other was ridged and sown with carefully-selected seed.

The results appear in the following table :—

Number of field.	Manner of sowing.	Area in square yards.	Actual outturn. Cotton.	Actual outturn. Seed.	Outturn per acre. Cotton.	Outturn per acre. Seed.
			lb. oz.	lb oz.	lb.	lb.
1	Sown on tops of ridges 3′ apart with selected acclimatised New Orleans cotton seed.	1,216	47 6	124 14	188·5	497·0
2	Sown on tops of ridges 3′ apart with acclimatised seed.	457	12 2	30 14	128·4	326 9
	Sown on slopes of ridges 3′ apart ...	546	15 12	38 14	139·6	344 6
	Sown in lines 3′ apart ...	369	10 6	26 14	136·0	352·5
	Broadcast ...	574	14 1	37 5	118·5	314·6
3	Sown on tops of ridges 3′ apart with fresh New Orleans seed.	851	16 14	37 10	95·9	213·9
	Sown on slopes of ridges 3′ apart ...	376	6 12	15 0	86 8	193·0
	Sown in lines 3′ apart ...	861	14 6	32 13	80·8	184·4
	Broadcast ...	480	6 14	15 10	69 3	157·5
4	Sown in lines 3′ apart, subsequently ridged up, with fresh seed.	400	6 10	14 2	80·1	170·9
	Sown in lines 3′ apart, subsequently not ridged.	426	5 13	13 6	66·0	151·9
5	On tops of ridges 3′ apart with fresh seed,	592	7 13	16 15	63·8	138·4
	On slopes of ridges 3′ apart ...	543	7 4	15 14	64 6	141·5
	In lines 3′ apart ...	537	7 7	16 9	67·0	149 2
	Broadcast ...	562	8 1	17 6	69 4	149 6

The high outturn of 188·5lb. of clean cotton on a field, the soil of which was distinctly inferior, indicates the commercial value of selected seed.

Nankin cotton. In addition to the fields already noticed 10 fields were sown with Nankin cotton. A large quantity of seed was received from Central India very late in the season and was sown wherever space could be found for it.

The yield varied from 144·5lb. of clean cotton on good soil accessible to irrigation to 45·1lb. on land when the conditions were most unfavourable.

(3) Sorghum.—A quantity of seed of the Minnesota amber cane was imported from America, with which four large fields were sown, while a fifth field was sown with farm acclimatised seed.

To portions of each of the last four fields cowdung manure was applied at the rate of 100 maunds per acre. Past and present treatment of these fields is shown below :—

Number of field.	*Previous treatment.*			*Treatment in* 1883.				
	Year.	Manure.	Crop.	Manure.	Ploughing.	Weeding.	Irrigation.	Seed and rate per acre.
1	1880-81 ...	Dung ...	Sugarcane	Nil ...	2	2	1	Amber sorgho 12 lb.
	1881-82 ...	*Nil* ...	Lucerne					
	1882-83 ...	*Nil* ...	Tobacco					
2	1880-81 ...	Guano ...	Sugarcane	Half manured with dung at the rate of 100 maunds to the acre.	2	2	1	Ditto.
	1881-82 ...	Cowdung ...	Wheat and tobacco ...					
	1882-83 ...	*Nil* ...	Juar in kharif and gram in rabi.					
3	1880-81 ...	*Nil* ...	Fallow	Ditto ...	2	2	*Nil.*	Ditto.
	1881-82 ...	*Nil* ...	Ditto					
	1882-83 ...	*Nil* ...	Wheat					
4	1880-81 ...	*Nil* ...	Fallow	Ditto ...	2	2	*Nil.*	Ditto.
	1881-82 ...	*Nil* ...	Millets					
	1882-83 ...	*Nil* ...	Barley					
5	1880 81 ...	*Nil* ...	Pulses and til ...	Ditto ...	2	2	1	Red sorgho 10 lb.
	1881-82 ...	Dung ...	Cereals					
	1882-83 ...	Hemp ...	Ditto					

Up to the break in the rains these crops were remarkably fine; but the long break told heavily, especially in the crops grown on the manured sections.

Sugar manufacture commenced on the 15th October and lasted till the 10th November. The juice was carefully strained and fumigation with sulphur of vessels and mills was freely resorted to, to avoid *inversion* through fermentation.

Gur was made by the ordinary native method, and *rab* in an "evaporator."

The following table gives results and averages, the figures obtained at the farm in working up sugarcane juice being also given for the sake of comparison :—

	Sorgho.									Sugar-cane.
	Field 1.	*Field* 2.		*Field* 3.		*Field* 4.		*Field* 5.		
	Unmanured.	Unmanured	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	
Area in square yards	4,324	2,155	2,414	1,726	1,735	1,215	1,720	1,545	400	1,717
Actual weight of cleaned cane lb ...	5,550·5	2,914	2,438	1,905	1,755	984	1,337	1,992	433	11,158
Ditto dry and worm-affected canes, lb. ..	1,541 5	410·5	710·75	421	520	331·5	493	506	125	...
Ditto leaves and tops, excluding the weight of grain, lb.	2,605·5	1,255	1,160·25	762	615	585 5	610·5	1,094	278	4,440
Total outturn of canes and leaf, lb. ...	9,697·5	4,579 5	4,309	3,088	2,890	1,901	2,440·5	3,592	836	15,598
Actual weight of grain, lb.	198 5	180	124	74·5	76 75	53	68	106	37 25	...
Ditto of juice of which *gur* was made, lb.	1,153 5	519	846	183·5	208·75	453	639	925	193	684
Ditto of which *rab* was made, lb. ...	1,516·25	927·5	226 25	727 25	649·25	...	...	...	...	5,069
Total juice ...	2,669·75	1,446·5	1,072·25	910 75	858	453	639	925	193	5,753
Weight of *gur* made, lb.	186·5	76·5	125·5	28·75	30·5	73 5	107	140·5	34·25	90 7
Ditto of *rab* made, lb.	276·0	184·75	42	183·75	123·0	...	...	...	...	783·0
Weight per acre of cleaned cane, lb. ...	6,213	6,545	4,888	5,342	4,896	3,920	3,762	6 240	5,239	31,452
Ditto dry and worm-affected canes, lb. ...	1,725	922	1,425	1,180	1,450	1,321	1,387	1,585	1 512	...
Ditto leaves and tops, lb.	2,917	2,818	2,326	2,137	1,716	2,332	1,718	3,427	3,364	12,516
Ditto total weight of cane and leaf, lb. ...	10,855	10,285	8,639	8,659	8,062	7,573	6,867	11,252	10,115	43,968
Ditto seed	222·1	404·2	248·6	208·9	214·1	211·1	191·3	332·0	750 7	...
Ditto juice	2,988·3	3,248 7	2,149·8	2553 8	2393·4	1,804·5	1,798 1	2,897·7	2,335·3	16,216·9
Ditto *gur* if all the juice were turned into *gur*, lb.	483·1	478·8	313·9	400·1	349·6	292 7	301·0	440·1	414·4	2,151·5
Ditto *rab* ditto *rab*, lb. ...	543·9	647 1	399·0	469·6	453·4	...	...	...	...	2,505
Percentage of juice over cleaned cane, lb. ...	48·1	49 6	43·9	47·8	48·8	46·	47·7	46 4	44 5	51·5
Ditto *gur* over cleaned cane, lb. ...	7·7	7·3	6·5	7·5	7·1	7·4	8 2	7·0	7·9	6·8
Ditto *gur* over juice, lb.	16·1	14·7	14·8	15·6	14 6	16 2	16·7	15·1	17·7	13·2
Ditto *rab* over cleaned cane, lb. ...	8·7	9 8	8·1	8 7	9 2	...	...	...	...	7·9
Ditto *rab* over juice, lb.	18·2	19·9	18 5	18 3	18·9	...	...	...	...	15·4

The total amount of gur made amounted to 803lb., of which 373lb. were sold in open market at Cawnpore at * Rs. 2-13-9 per maund of 82lb.; of the rest 100lb. were sold at Rs. 6-10-8 per maund at the beginning of the season, before sugarcane gur had come to market. The remaining quantity was reserved for distribution and exhibiting at the various agricultural shows. 759·5 lb. of rab were made, which realised Rs. 2-8-0 per maund of 82lb.

Annexed are analyses kindly undertaken by Carew and Co., Limited, Rosa :—

Analysis of two samples of sorghum sugar received from the Government Farm, Cawnpore, March 12th, 1884.

	Rab.	Gur (last year's).
Crystallized sugar	62·50	63 08
Glucose	18·54	17·75
Ash	1·80	3·87
Insoluble ash	1·65	1 75
Colouring matter and extractive	5·31	6·79
Water	10·20	6·76
	100·00	100·00
Available sugar ...	37·66	31 79

* Rate of sugarcane gur on the same day—

	Rs.	a	p.
1st quality	3	6	0
2nd do.	2	12	3
Average ...	3	1	1·5

The following tables give full particulars of average production, value, cost and profit as compared with sugarcane :—

I.—Table showing average outturn of amber sorgho on the unmanured fields and of sugarcane per acre.

	Sorgho.	Sugarcane.
	℔	℔
Average outturn of cane and leaf	9,898	43,968
Weight of cleaned cane	5,833	31,452
Ditto of worm-affected canes and leaf	4,065	12,516
Ditto of gur	445·4	2,151·5
Ditto of grain	260	..

II.—Table showing value of produce per acre of sorgho and sugarcane.

	Sargho.	Sugarcane.
	Rs. a. p.	Rs. a. p.
* Value of gur per acre at Rs. 4-3-4 per maund of 82℔.	22 13 8	110 6 7
† Value of leaves and dry canes at Rs. 15 per 100 maunds	7 7 0	...
‡ Value of grain at Re. 1 per maund of 82℔.	3 2 6	...
Total	33 7 2	110 6 7

* Average of the last 4 years' prices prevailing at the Cawnpore market.

† Last year the value of leaves was calculated at Re. 1 per 10 mds. This year fodder has been very dear, and Re. 1-8 is the average of what was paid for the *juar* purchased for ensilage.

‡ Last year the value of grain was taken at 12 annas per maund of 82℔., but this year the rate of Re. 1 per maund was obtained.

III.—Table showing cost of produce per acre of sorgho and sugarcane.

	Sorgho.		*Sugarcane.*¶	
	No.	Cost.	No.	Cost.
		Rs. a. p.		Rs. a. p.
Ploughing	2	1 8 0	8	6 0 0
Clod-crushing	2	0 4 0	6	0 12 0
Sowing	...	0 10 0	...	1 14 0
Watering	1	*1 4 0	7	13 9 0
Weeding and hoeing	2	†4 0 0	6	12 0 0
Watching ‖	...	0 12 0	...	2 0 0
Cutting and cleaning	...	‡4 0 0	...	...
Manure		§...	...	6 0 0
Seed	...	0 4 0	...	6 0 0
Rent	...	4 0 0	...	12 0 0
Sugar boiling at Re. 1-6 per maund of *gur*	...	7 12 0	...	36 1 0
Total	...	24 6 0	...	96 4 0
Value of produce	...	33 7 2	...	110 6 7
Net profit	...	9 1 2	...	14 2 7

* Only two out of the four fields whose average is calculated were watered.

The cost of one watering, including canal dues, is Rs. 2-8-0 : hence Rs. $\frac{2\text{-}8\text{-}0}{2}$ = 1-4-0.

† Last year the cost of weeding was only Rs. 2 per acre as the fields were weeded only once.

‡ Last year the cost of cutting was given at Rs. 2 per acre, and the cost of cleaning included in the cost of sugar boiling, which was given at Re. 1-12.

§ No manure applied to fields of which average was taken.

‖ Was omitted last year.

¶ The following items of expenditure differ from those given in Part I., "Field and Garden Crops":—

	Farm.	*"As given in Field and Garden Crops."*
	Rs. a. p.	Rs. a. p.
1. Ploughing	6 0 0	8 0 0
2. Watering	13 9 0	12 5 0
3. Weeding and hoeing	12 0 0	9 8 0
4. Cutting	..	2 8 0
5. Seed	6 0 0	8 0 0
6. Rent	12 0 0	10 0 0

The differences are thus explained—

1. Ploughing—The farm field was ploughed only 8 times ; in "Field and Garden Crops" the number of ploughings is 12.
2. Watering—Also due to a difference in number.
3. Weeding and hoeing—Ditto.
4. Cutting—Cutting and cleaning usually done by men who get the tops of cane and not paid in cash ; as the value of these is not taken into account in the produce of the field, the cost of cleaning and cutting should not be entered.
5. Seed—Due to difference in rates.
6. Rent—Calculated at Rs. 8 per acre for 18 months, the time occupied by cane.

(4) **Ensilage.**—Juar and sorghum were separately ensilaged in masonry vats and juar alone in three simple earthen pits dug in waste soil near the bank of a nullah. All were thatched over. It was thought very probable that in the earthen pits the fodder would be attacked by white ants, but this was not the case. The juar was cut small by two men, who with a chaff-cutter delivered 4 maunds per hour. The amount cut daily was trodden down in the evening by farm labourers as extra work at wages of 2 pice each. A layer of 2 inches of *bhusa* was spread over it and weighted with baskets of broken bricks (giving 66lb. of weight per square foot) and left to sink for 48 hours. This was continued till the pits were full.

The cost of cutting and filling came to Re. 1-2 per 100 maunds.

In the first pit opened 13,262lb. of green fodder were filled in by the 21st October. It was opened on the 2nd February, 1884, and 10,658lb. of fodder taken out, of which 9,854lb. was in most excellent condition. The waste consisted of the somewhat mouldy surface layer. There were no traces of white ants.

The whole of the fodder was fed off to the farm cattle and evidently much relished. Cultivators from the neighbouring villages who came to see the pit opened seemed surprised at the results and stated that they should try a silo on their own account next season.

The question of cost will be gone into in the rabi report, by which time the whole quantity stored, or 44,586lb., will have been fed off.

IMPLEMENTS.

Ploughs.—The Duplex plough, mentioned in the last rabi report, was altered in such particulars as further experience suggested, the principal being the substitution of an iron sole and step in the place of wood. The alterations were made for the sake of strength, as well as to add weight to the plough, to steady it when ploughing deep. Two of these ploughs are kept constantly at work on the farm and six of the latest pattern have been sent out for trial to different persons interested in agricultural matters. Up to 30th November 57 Duplex ploughs of the original pattern were sold and 35 distributed for trial. It was exhibited at the Bulandshahr, Meerut, Saháranpur, and Aligarh Exhibitions. At Bulandshahr it got the first and a special prize ; at Meerut it was awarded a certificate of merit ; and at the last two exhibitions has been reported as deserving a first prize had exhibits from outside districts been admitted to competition for prizes.

The Kaisar plough was also exhibited at these exhibitions. At Meerut it headed all the ploughs offered for trial and it was well reported on at the other exhibitions ; 154 were sold during the season.

Waterlift.—The 5′ chain lift, trials of which were noticed in the last rabi report to be not so satisfactory as those for other depths, was subjected to a different mode of trial suggested by Mr. W. J. Wilson, C.E.

The results of these experiments and the details of the labour employed are shown below :—

Labour employed.	Average quantity of water lifted per hour.
	Cubic feet.
4 men—two working at a time and relieved after every 2 hours	1,451·6
2 men and 2 women—one man and one woman working at a time and relieved after every 2 hours	1,363·6
4 women—two working at a time and relieved after every 2 hours	1,250·0
2 men working for 4 hours continuously and then working again after a recess of 2 hours at noon	1,313·8

14 pumps were sold during the season.

Winnowers.—To the friction wheel a spiral spring has been added, so as to maintain pressure. This has so far proved satisfactory. Six of the improved pattern have been sold. During the coming rabi harvest one of the improved pattern will be given a continued trial at the farm.

Cotton gin.—The saw gin reported in the last report having been found to affect injuriously the short staple of the indigenous cotton, efforts were made to make a cheap roller gin at the farm after the model of Dobson's knife gin. A difficulty yet to be overcome is the crushing of the seed, the admixture of fragments of which lowers the value of the lint.

Evaporators or sugar-boiling.—The evaporators having found so much favour at the agricultural shows last year, manufacture was taken up at the farm. An evaporator of galvanised iron sheet for setting up on a *kachha* brick or clay furnace, together with iron ladle, strainer, and iron grating for furnace, can be made up for Rs. 40. A clay furnace costs about Rs. 1-8 and answers admirably. Four evaporators have been sold and have all been reported on as giving satisfaction. Rai Ajudhya Prasad of Indulpur writes :—" The evaporator worked very nicely. I prepared about 60 maunds rab in it. The result I will enter in my annual report.

The Farm Superintendent, Lachhman Parshad Barma, has had much extra work to do during the past season in preparing collections of grains, fibres, and models of implements for the Calcutta Exhibition. His careful, intelligent management of the farm is therefore all the more to his credit. The collections referred to have won medals and certificates of merit at the Exhibition, of which details will be given in the next report. It is to this extra work that is due such delay as has occurred in preparing the figures for the report.

D. G. PITCHER, MAJOR,
Assistant Director for Oudh,
In charge of Farm.

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